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ABSTRACT

This paper presents estimates of the added costs and potential savings associated with reorganizing public education from the current unintegrated system to a fully integrated P-16 system. (P-16 systems are attempts to create a coherent, flexible system of public education that stretches from preschool through the fourth year of college.) Models for building the estimates are created for a hypothetical state with characteristics that, when multiplied by 50, would represent the country as a whole. The models, however, are based on work done in actual states and programs. The models explicitly link resources to objectives associated with particular levels of service or particular levels of performance. Using the models, the paper examines three primary components of the P-16 system likely to have cost implications: (1) the cost of providing universal prekindergarten services; (2) the cost of implementing a competency-based approach to student progress; and (3) the cost of restructuring the relationship between high schools and colleges. For each component, the paper presents a low-cost, medium-cost, and high-cost scenario, presented in tabular form. (WFA)

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Education Commission of the States

Estimated Costs of Organizing a P-16 Education System

By John Augenblick and Josiah Pettersen

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Preschool Through Postsecondary

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Introduction

The purpose of this report is to estimate added costs and potential savings associated with reorganizing the education delivery system from the current unintegrated preschool-through-college structure to a fully integrated P-16 system.

The three primary components of the P-16 system likely to have cost implications are:

- Services available universally to children as young as two years old
- A competency-based approach to student progression from early childhood education through college
- A restructuring of the relationship between high schools and colleges to provide alternative ways for students to obtain services in the 11th and 12th grades.

Other elements, such as activities necessary to coordinate the system or the information management requirements of such a system, are either relatively inexpensive or nearly impossible to calculate. Also, while it might make sense to provide fiscal incentives of one sort or another to families to encourage student achievement, it is beyond the scope of this paper to address the approach that might be used to provide incentives or the magnitude of the incentives.

In order to make cost estimates, it is necessary to describe some of the cost-related characteristics of the current education system. We do this for a hypothetical state — that is, a state that does not actually exist. In this case, the hypothetical state is one with characteristics which, when multiplied by 50, would represent the nation as a whole. After describing the hypothetical state, we develop procedures to identify the resources that might be needed to implement each of the three primary components of the P-16 system. We examine each component separately using models that explicitly link resources to objectives associated with particular levels of service or particular levels of performance — "low," "medium" or "high."

The models we use to estimate costs are of our own design, based on work we have done in several states and on the programs actually being used in some states. While we believe they are logical and orderly, they make assumptions about the relationships between resources and objectives that can, and should, be questioned. We know of no research that is widely accepted as specifying the relationship between the magnitude of resources provided for education and either specific levels of service that can be provided or student performance that can be attained.

It should be noted that significant cost savings might be associated with the kinds of changes contemplated by using a P-16 structure. We believe, however, that many of those savings will not be seen until the new system has been in place for 10 years or so — well beyond the five-year time frame used in our projections and estimates. One area where savings could occur in the short term is in the relationship between high school and college. If a state moved quickly to implement some of the changes contemplated, it is possible that significant numbers of students could eliminate one year, or at least a semester, of high school. But for the most part, we do not anticipate significant cost savings within five years.

The purpose of this report is to estimate the annual current operating costs of reorganizing the education system, including providing certain services. The report does not address either capital costs or the issue of where the revenue needed to pay for those services would come from (except in those situations where we specify that families would be expected to provide resources).

The Hypothetical State

In order to make cost estimates, it is necessary to know the environment in which such estimates are calculated, including characteristics of the population, participation in education programs, demographic attributes of students, numbers of service providers and their salaries, information about student performance and so on. Below we describe that information for a state that represents one-fiftieth, or 2%, of the nation (based on national averages for some data). Among other things, this description provides a baseline of current spending for education against which any added costs, or cost savings, associated with the P-16 system can be compared.

The hypothetical state has a population of 5,484,000 people, with 35.3% of all people under 25 years old and approximately 1.4% of all people in each year of age for birth through 24 years old. There are 1,437,000 households, with a median family income of $38,900; and while 18.1% of families earn less than $15,000, 20.1% earn more than $75,000. Young children tend to be in families with lower income levels; for example, while 10% of all families have incomes below the poverty level, 18.3% of families with children under 18 years of age have incomes below the poverty level.

The proportion of people enrolled in school is highest for people 5-17 years old (94-99%), while it declines from 61.5% to 5.7% for people 18-34 years old. Fifty-two percent of all three- and four-year-old children are enrolled in school. Of the 922,537 children in school, 13,630 are in pre-kindergarten (pre-K) classes, about 70,000 are in each grade for grades 1-8, and the number of pupils in grades 9-12 decreases by about 33% between 9th grade and 12th grade. At the same time, 286,920 students are enrolled in two- or four-year postsecondary institutions (undergraduate), with about 38% in two-year colleges and 62% in four-year colleges. Of students in two-year colleges, 64% attend on a part-time basis and 97% attend public institutions. Of students in four-year colleges, about 71% attend on a full-time basis and 66% attend public institutions.

Looking specifically at children 3-5 years old, there is a variation in the proportion of pupils enrolled in school at all, the proportions of pupils in public and private schools, and the proportion of pupils attending on a full-day basis. For three-year-olds, 38.7% are enrolled in school (a little more than half of them in private nursery schools), and about half attend on a full-day basis. For four-year-olds, 66.1% are enrolled in school — about 47% of whom are in private nursery schools and kindergartens, and 44% of whom attend on a full-day basis. For five-year-olds, 88.5% are enrolled in school. About 81% of those in school are enrolled in public kindergartens or nursery schools, and roughly half of them attend on a full-day basis.

Children in elementary and secondary schools have a variety of special needs, including 5% with difficulty speaking English, about 33% coming from families that qualify for federally subsidized meals and 13% with special education needs, including those in preschool.

Expenditures for education are driven to a significant extent by the number of staff and their salaries. For K-12 education, 54,923 teachers, for a ratio of 16.8 students per teacher, were paid an average of $40,582 (with added benefits of about 25%). Current operating spending for K-12 education is $6,189 per student. Therefore, excluding benefits, teacher costs represent 40% of current spending. Pre-K expenditures are estimated to be $4,639 per child.

For postsecondary education, there are 18,634 faculty, paid an average of $49,309, excluding benefits. Expenditures for postsecondary education average $7,530 per student for two-year colleges and $21,916 per student for four-year colleges. Remedial services in postsecondary institutions are estimated to cost $56.8 million — $48.6 million at two-year colleges and $8.2 million at four-year colleges.

Total spending for education is: $469 million for pre-K programs, $5.688 billion for K-12 programs, and $2.769 billion for four years of postsecondary programs.

Revenues available for education expenditures come from four primary sources: federal, state and local taxes and family-paid tuition. For pre-K, approximately $98 million is available from federal sources and the remaining $371 million is divided between states and parents (in an unknown proportion). At the K-12 level, $444 million comes from federal sources, $3.153 billion from state sources and $2.9 billion from local sources; state and local sources include $809 million above current expenditures for capital purposes and fund balance. For postsecondary education, $773 million is from tuition, $640 million is from the state, $335 million is federal, $78 million is local revenue and the remaining $943 million is from revenues from services (mostly hospitals, at $601 million), endowment income and other revenue.

These figures show that about $8.926 billion is spent to serve 1.223 million students enrolled in pre-kindergarten through senior year of college, in the hypothetical state. Below, we discuss the added costs, and potential savings, associated with transforming the education delivery structure to a P-16 system.

The Cost of Providing Universal Pre-Kindergarten Services

To estimate the cost associated with providing an increased level of state support for early childhood education, we identified several relevant variables affecting the numbers of children for whom service would be provided, the nature of the service to be provided and expectations about parental support in paying for services.

Cost Factors

- Ages of children to be served (two-, three- or four-year-olds) and the proportion of the population likely to enroll
- Amount of education provided based on the length of day (full day or half day), the number of school days in the year and the percent of population enrolled
- Level of services provided based on the teacher-student ratio, the salary level of teachers, the ratio of teachers to teacher aides and the salary of teacher aides
- Additional costs, including administration, plant maintenance and operation, and supplies/materials (estimated at 50% of salaries).

Revenue Sources

- Level of parental contribution — the amount of revenue generated by tuition fees paid by parents based on family income
- Federal aid, which is assumed to be constant at $98 million (Head Start and Even Start)
- State aid, which is calculated as the difference between total cost and both family and federal revenue.

Once we determined the relevant variables, we developed a simulation model, using several formulas, that reflects the interaction of all these factors.

As discussed above, we calculated the costs and revenues associated with a low-, medium- and high-cost scenario. The characteristics, cost and revenues for each of these scenarios are as follows:

Low-Cost Scenario

Cost	Provides half-day service for 3-year-olds and full-day service for four-year-olds. Assumes 100% enrollment of preschool-age children, at an 18-to-1 student-teacher ratio. Teachers are paid at the average beginning salary of all teachers, or $24,000. The school year is 180 days and additional costs are 50% of salaries. This scenario also provides one teacher aide (paid at $15,000 per year) for every 15 students.
Revenue	Parental contribution is set at a level such that the highest wealth parents (earning more than $75,000 a year) are expected to pay the full cost of the program while parents with lower incomes are expected to pay the same proportion of their annual income as parents with a $75,000 income (or 4% of annual income). The federal contribution is estimated to be $98 million.

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Medium-Cost Scenario

Cost	Provides full-day programs for three- and four-year-old children. Includes 100% enrollment, and a 12-to-1 student-teacher ratio. Teacher salaries are calculated as the mean of the average beginning teacher salary and the average salary of all teachers, or $36,000. There are 180 days in the school year, with 50% additional costs. In this scenario, there is one teacher aide (at $15,000 per year) for every 10 students.
Revenue	Parental contribution is based on the same formula as used in the low-cost scenario, producing a contribution level of 8% of income in this instance. The federal contribution remains the same.

High-Cost Scenario

Cost	Provides half-day service to two-year-olds and full-day service for three- and four-year-olds. Assumes 100% enrollment and a student-teacher ratio of 8:1. Teacher salaries are at the actual average of all teachers, or $42,000 per year. This scenario provides 206 days in the school year, with 50% additional costs. This scenario does not include funding for teacher aides because the student/teacher ratio is low.
Revenue	Once again, parental contribution is based on the same formula, but in this case it is at a 12% contribution level. Federal contribution remains the same.

The table below indicates the total cost of these scenarios and the sources of revenue for each scenario in comparison to the current situation. Clearly, the low-cost scenario would cost less than what is estimated as being currently spent for pre-kindergarten services, while the medium-cost scenario would be nearly twice as expensive and the high-cost scenario would be more than three times as expensive as the current situation. As far as revenues are concerned, given constant federal funds, the full burden of paying the costs associated with the medium- and high-cost scenarios falls on the state and families.

Expenditures and Revenues for Universal Pre-Kindergarten in the Hypothetical State (figures in millions)

	Estimated			
Expenditures	**Current**	**Low**	**Medium**	**High**
Total	$469	$344	$913	$1,710
Children Served[1]	118,830	114,667	152,167	190,000
Per-Child Expense	$3,947	$3,000	$6,000	$9,000
Revenues				
State	[2]	$82	$380	$797
Local	--	--	--	--
Federal	$98	$98	$98	$98
Family	[2]	164	$435	$815
Other	--	--	--	--

[1] Children served is expressed as full-time equivalent (that is, half day = .5).
[2] State and family total $371 million but the split between them is unknown.

The Cost of Implementing a Competency-Based Approach to Student Progress

To begin, we established "target" levels of competency that students would ultimately need to meet (and when they would need to be met), so that students could choose between remaining in high school or moving on to postsecondary education.

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We used the National Assessment of Educational Progress (NAEP) reading, math and science assessments as the competency tests, and set the level of performance considered adequate as that described by NAEP: Students can "search for specific information, interrelate ideas and make generalizations about literature ... perform moderately complex [mathematical] procedures and reasoning exercises ... and analyze scientific procedures and data." This level (the sixth in NAEP's seven levels of achievement) is currently attained by 82% of high school seniors in reading, by 97% in mathematics and by 85% in science. In our view, these levels are reasonable benchmarks of expectations for 10th-grade students, if somewhat low compared to the expectations some states have for high school graduates.

Combining these proportions, we created a model that blends two resources, student-teacher ratio and length of school year, to improve student performance. Again, we created three scenarios (low, medium, and high) that reflect the proportion of students meeting the competency standard and the grade level by which it would be met. The model is a best estimate based on logic, our experience in states and research.

In addition to the resources used in the model, we also examined the cost of other resources some people believe are associated with improved student performance, including: (1) numbers of days available for professional development; (2) other personnel, including "standards implementation coordinators," "record keepers," "special needs coordinators" and added counselors. These resources were held constant across the low, medium and high scenarios because we could not estimate their particular impact on student performance and simply assumed that they must be present at some minimum level to facilitate the other factors that do vary. Also, we included a $15-per-student expense to cover assessment costs. The scenarios are described below.

Low-Cost Scenario

Additional Costs	The teacher-student ratio in this scenario is the same as the national average (1:16.8), generating no additional costs. The school year is extended by 10 days for at-risk students (pupils from low-income families). In addition, two days of professional development for all staff are included. Under this scenario, 90% of students meet the competency standard by 12th grade, at an added cost of $116 million (or $128 per K-12 pupil).

Medium Cost Scenario

Additional Costs	The teacher-student ratio in this scenario is increased to 1:14. The school year is extended by 20 days for at-risk students and the school day is extended by one hour, or 17%, for the same students. In addition, five days of professional development for all staff are included. Under this scenario, 100% of students meet the competency standard by 10th grade, at an added cost of $599 million (or $659 per K-12 pupil).

High-Cost Scenario

Additional Costs	The teacher-student ratio is further increased to 1:12. The school year is increased by 30 days for at-risk students and their school day is increased by two hours. In addition, 10 days of professional development for all staff is included. Under this scenario, 100% of students meet the competency standard by 8th grade, at an added cost of $1.099 billion (or $1,209 per K-12 pupil).

In summary, the cost of these scenarios adds between $116 million and $1.099 billion to the current $5.688 billion cost of K-12 education, or between 2% and 19.3%. Although all students meet the competency standard well before 12th grade in the medium- and high-cost scenarios, we do not anticipate the result being accomplished fully within five years of the resources being provided. There

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may be some savings, however, due to fewer students requiring remedial services in postsecondary settings, which is described in the savings section.

The Cost of Restructuring the Relationship Between High Schools and Colleges

In order to estimate the cost of restructuring the relationship between high schools and colleges, we focused on three areas: (1) Advanced Placement (AP) programs, (2) vocational/technical education and (3) dual enrollment.

Based on information from the College Board, we determined that about $1.9 million is spent in the hypothetical state for AP purposes — divided roughly equally among the fees paid by families and federal, state and local sources. As for the cost of existing "tech-prep" programs, we believe that the hypothetical state spends about $30.6 million on vocational/technical education (assuming that vocational education requires spending about 15% above average per-pupil spending, and that about 30% of all 11th- and 12th-grade students participate in vocational programs). State sources account for roughly one-third of the $30.6 million, and localities account for about two-thirds. Given limited experience with dual enrollment, we are unable to determine what is currently being spent for such programs.

Again, we created three scenarios that reflect differences in the class size of AP programs and the proportion of AP costs the state would pay; the cost of transforming vocational/technical programs into comprehensive "tech-prep" programs based on the cost of community college programs; and the proportion of students expected to participate in dual-enrollment programs and the way the state would allocate aid to schools and colleges in recognition of dual enrollment.

Low-Cost Scenario

Cost	This scenario assumes that the cost of AP programs remains the same, the cost of tech-prep programs is $500 less than the per-pupil costs of community college programs, and that 5% of all 11th and 12th graders participate in dual-enrollment programs (splitting their time evenly between high school and college), which we assume to be the status quo. Because the cost of tech-prep is lower than the cost of vocational/technical programs, there is a net savings of $2.5 million.
Revenue	We assume that the state pays the cost of AP testing for students from low-income families, that the state pays one-third of all tech-prep costs and that the state pays for dual enrollment at the same rate it currently pays for high school (leaving high schools to allocate funds to colleges to pay for activities that students undertake away from high schools). Given the savings in total cost, revenues decrease as follows: the state by $.6 million, localities by $1.8 million, families by $.1 million.

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Medium-Cost Scenario

Cost	This scenario assumes that the cost of AP programs rises to reflect lower class size (5% lower than average), the cost of tech-prep programs is the same as the cost of community college programs, and that 10% of all 11th and 12th graders participate in dual-enrollment programs (splitting their time evenly between high school and college). The added cost of these modifications is $23.8 million (or $214 per pupil in 11th and 12th grade).
Revenue	We assume that the state pays half of the added cost of reducing AP class size as well as the cost of AP testing for students from low-income families, that the state pays a third of all vocational/tech-prep costs and that the state pays for dual enrollment by reimbursing schools at half of the average cost per pupil of schools, and reimbursing colleges at half the average cost of two-year colleges. Therefore, revenues change as follows: state revenues rise by $13.5 million, local revenues rise by $10.4 million, while revenue provided by families decreases by $.1 million.

High-Cost Scenario

Cost	This scenario assumes that the cost of AP programs rises to reflect lower class size (10% lower than average), the cost of tech-prep programs rises to $500 above the per-student cost of community colleges, and that 20% of all 11th and 12th graders participate in dual-enrollment programs (splitting their time evenly between high school and college). The added cost of these changes is $78.4 million (or $704 per pupil in 11th and 12th grade).
Revenue	We assume that the state pays half of the added cost of reducing AP class size, as well as the cost of AP testing for students from low-income families, that the state pays a third of all vocational/tech-prep costs and that the state pays for dual enrollment by reimbursing schools at 70% of the average cost per pupil of schools, and reimbursing colleges at half the average cost of two-year colleges. Therefore, revenues change as follows: state revenue rises by $55.5 million, local revenue rises by $23.0 million, while revenue provided by families decreases by $.1 million.

Cost Savings

There are two primary sources of cost savings associated with the changes described above that are likely to happen within five years. First, we anticipate that up to half of the amount currently being spent on postsecondary remediation, or $28 million, could be saved in the medium-cost scenario while all remediation costs, or $56 million, could be saved in the high-cost scenario. Second, there would be savings associated with the fact that fewer students are likely to be in high school for 12th grade. Under the low-cost scenario, we estimate that 5% of 12th graders would actually skip 12th grade and move into community colleges, saving an estimated $17.2 million. Under the medium-cost scenario, we believe that 10% of students might not participate in 12th grade, saving $34.5 million. And under the high-cost scenario, 20% of students might not enroll in 12th grade, leading to a savings of $69.0 million.

Other Costs

One other cost associated with these scenarios might result from the potential for a higher proportion of high school seniors to choose to participate in postsecondary education. Given that about 70% of high school graduates currently enroll in postsecondary education (and that it might take a few years until the changes described above have an impact on college-going behavior), we believe that it is reasonable to assume a 1% increase in postsecondary participation under the low-cost scenario, a 3% increase in postsecondary participation under the medium-cost scenario, and a 5% increase in postsecondary participation under the high-cost scenario. Making these assumptions (and assuming that new students would attend community colleges), costs would rise by $3.77 million under the low-cost scenario, by $11.31 million under the medium-cost scenario, and by $18.85 million under the high-cost scenario.

Conclusion

It is possible to combine added costs across the focus areas we have examined in multiple ways (there are 27 possible combinations). The range of added costs is associated with the difference between combining all "low" scenarios and combining all "high" scenarios. Added costs are shown below (keeping in mind that current costs for pre-kindergarten, K-12 and undergraduate postsecondary education are $8.926 billion).

In looking at total added costs, it appears possible to make some modest changes in the system that would only add $100 million in new expenditures. At the other end of the spectrum, implementation could result in net added costs of as much as $2.312 billion.

In the middle of the spectrum, combining all "medium" scenarios across focus areas generates an added cost of $1.015 billion above current spending of $8.926 billion (or an 11.4% increase). This expenditure would both expand education resources, making education services available to more people, and boost the education attainment of students. In fact, extended opportunities for early childhood education, combined with smaller classes in 11th and 12th grade and the possibility of dual-credit enrollment, a longer school year and more professional development, would likely result in dramatically higher levels of performance, less time required to graduate from high school and college, increased enrollment in postsecondary education, and a variety of other benefits that could improve the efficiency of the education system. In the long run, beyond the five years we used to estimate benefits, even greater accomplishments would be expected at no increase in cost.

Added Costs Associated with Implementing a P-16 Education System Using Alternative Scenarios
(all figures in millions)

	Scenario		
Focus Area	**Low Cost**	**Medium Cost**	**High Cost**
Pre-K	-$125	$444	$1,241
Competency	$116	$599	$1,099
Grades 11-12	-$3	$24	$78
Savings	-$17	-$63	-$125
Other Costs	$4	$11	$19
Net Added Cost	**$100***	**$1,015**	**$2,312**
Net Added Cost as Percent of Total Current Spending	**1.1%**	**11.4%**	**25.9%**
*Excluding the savings of $125 million for Pre-K.			

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